CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter provides a detailed methodology to determine the rainfall-runoff relationship for un-gauged catchment area. The method used for determining the relationship is Hydrologic Engineering Centre-Hydraulic Modeling System (HEC-HMS). For un-gauged catchment, there is lack of rainfall and streamflow data for that particular catchment area. For this study, rainfall data is very important for the stimulation of rainfall-runoff model. Furthermore, this research is aim to predict the streamflow data and to get appropriate model to predict discharge after calibration, validation and verification model. At the same time, the selection of the rainfall data and discharge data for validation and calibration process were based on the availability and the best quality of data sets as the rainfall and discharge station.

3.2 FLOW CHART OF METHODOLOGY

This flow chart indicates the methodology used for throughout this research as shown in **Figure 3.1.**

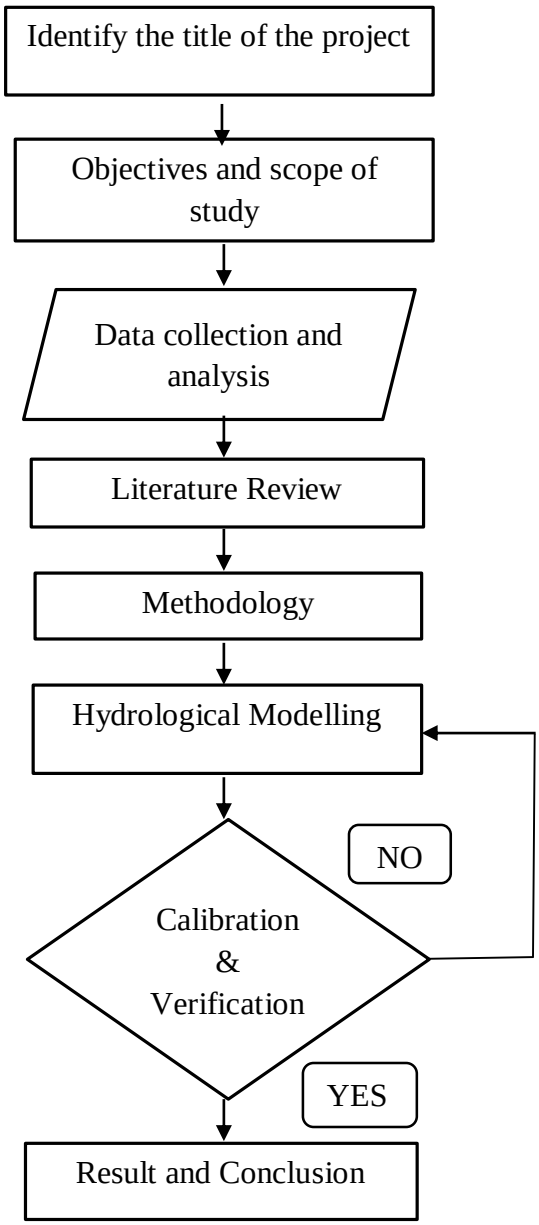

Figure 3.1: Flow chart of methodology

3.3 DATA COLLECTION

For this research, three rainfall data and one streamflow data are available. Although this is un-gauged catchment, data collection is still needed for the determination of rainfall-runoff relationship using HEC-HMS Model and also to predict the streamflow for the catchment area. In addition, HEC-HMS is used as a tool for creating hydrologic modeling of Sungai Betau, Sungai Jelai Kecil, and Sungai Serau. The data use for HEC-HMS and it souce are shown in Table 3.1.

Table 3.1: Data for HEC-HMS and the sources

	Data	**Source**
a.	Rainfall Data	The Department of Irrigation and Drainage (JPS)
b.	Streamflow Data	The Department of Irrigation and Drainage (JPS)
b.	Topography Data	The Department of Survey and Mapping Malaysia (JUPEM)

3.3.1 Rainfall Data

The rainfall data for this study are obtained from The Department of Irrigation and Drainage (JPS). The rainfall data is available from year 1999 to 2014. For this study, three rainfall data is being used. **Table 3.2** shows the name and rainfall station use in HEC-HMS Model. Rainfall data can be refer at **Appendix A.**

Table 3.2: Rainfall Station use in HEC-HMS Model

Station No	**Station Name**	**Increment**
RF 4218043	Paya Tepuai	Daily
RF 4514032	Ladang Teh Sungai Palas	Daily
RF 4620046	Merapoh at Pahang	Daily